

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property  
Organization  
International Bureau



10/519021



(43) International Publication Date  
8 January 2004 (08.01.2004)

PCT

(10) International Publication Number  
WO 2004/003508 A3

- (51) International Patent Classification<sup>7</sup>: C12Q 1/68, (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (21) International Application Number: PCT/US2003/020226
- (22) International Filing Date: 30 June 2003 (30.06.2003)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
60/392,192 28 June 2002 (28.06.2002) US  
10/373,609 24 February 2003 (24.02.2003) US  
10/373,600 24 February 2003 (24.02.2003) US
- (71) Applicant (*for all designated States except US*): PURDUE RESEARCH FOUNDATION [US/US]; 3000 Kent Avenue, West Lafayette, IN 47906 (US).
- (72) Inventors; and
- (75) Inventors/Applicants (*for US only*): LEE, Gil, U. [US/US]; 411 North 400 West, West Lafayette, IN 47906 (US). ANDRES, Ronald, P. [US/US]; 1003 North 21st Street, West Lafayette, IN 47904 (US).
- (74) Agents: MYERS, James, B., Jr. et al.; Woodard, Emhardt, Moriarty, McNett & Henry LLP, Bank One Center/Tower, Suite 3700, 111 Monument Circle, Indianapolis, IN 46204 (US).
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:  
— with international search report
- (88) Date of publication of the international search report:  
14 October 2004
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: MAGNETIC NANOMATERIALS AND METHODS FOR DETECTION OF BIOLOGICAL MATERIALS

(57) Abstract: Biological material in a sample is reacted with a novel functionalized superparamagnetic Fe/Au nanoparticle that specifically binds to the biological material in solution to produce a magnetic particle/biological material complex. The biological material is detected upon application of an external magnetic field which separates the magnetic bound complex from other components of the reaction mixture.

WO 2004/003508 A3

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/20226

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : C12Q 1/68; G01N 33/53; B22F 9/06; B01D 35.06

US CL : 435/6, 7.1, 7.2; 75/332; 210/222

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
U.S. : 435/6, 7.1, 7.2; 75/332; 210/222

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
Please See Continuation Sheet

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,541,072 A (WANG et al) 30 July 1996, see entire document.	1-52
Y	US 6,231,760 B1 (SIDDIQI) 15 May 2001, see entire document.	1-52
Y, E	US 6,682,584 B2 (POZARNISKY et al) 27 January 2004, see entire document.	1-52

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

Special categories of cited documents:	
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier application or patent published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

05 February 2004 (05.02.2004)

Date of mailing of the international search report

26 JUL 2004

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450

Facsimile No. (703) 305-3230

Authorized officer

Jezia Riley

Telephone No. 703-308-0196

**INTERNATIONAL SEARCH REPORT**

PCT/US03/20226

**Continuation of B. FIELDS SEARCHED Item 3:**

STN

search terms: magnetic particles, flux, movement, nanoparticles, binding